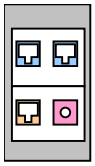
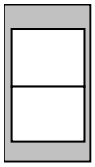
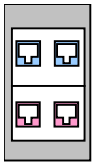
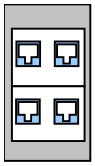
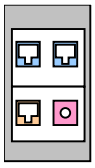
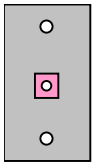
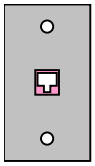
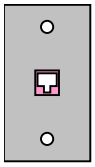
Appendix E. Design Samples and Drawings

E- 1 Sample Technology Outlet Configurations

It is recommended that schools define standard technology outlet configurations for different uses and users. Designations can be modified from school to school with the exact components of each outlet adapted to local conditions. The following chart depicts the typical types of outlets defined, where it is used, the types of jacks in the outlets, and a sample graphic of the outlet. These outlet types will be referenced in the sample diagrams that follow.

Outlet	Work areas	Jacks	Graphic
T	Teacher	2 - data 1 - desk phone 1 - video	
TV	Multimedia	1 - RF connector 1 - S-video 1 - video in 1 - right audio in 1 - left audio in 1 - VGA 1 - DVI-D 1 - USB	 As Required by Design
2S	Student	2 - data 2 - video	
4S	Student	4 - data	
A	Administrator	2 - data 1 - desk phone 1 - video	
V	Video	1 - RF video	

Outlet	Work areas	Jacks	Graphic
P	Utility	1 - wall phone	
WAP	All	1 - data	

Note:

1. Data, phone and unassigned jacks are RJ-45. Video jacks are BNC or Cat 6 type.
2. Data jacks have blue bezel, phone jacks have orange bezel, and unassigned jacks have red bezels. Video jacks have red bezels.
3. Outlets mounted at receptacle height (18” above finished floor – AFF) except for:

   P which is mounted at 44" AFF

   V outlets that are mounted at approx. 7'

   WAP outlets that are mounted approx. 12” below hung ceiling

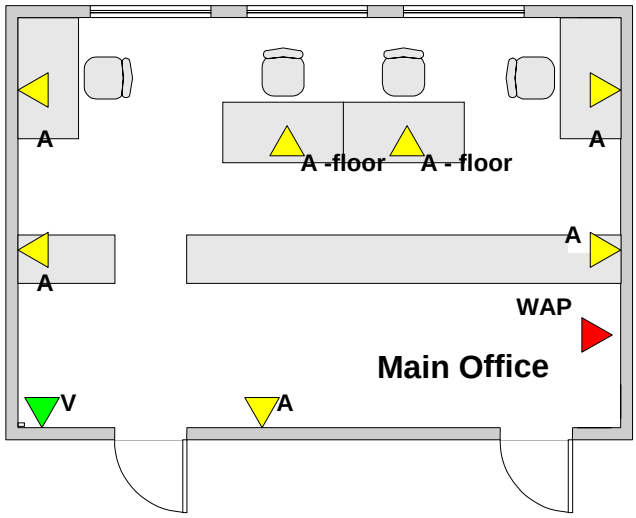
These outlet configurations become the basic building blocks for providing network services throughout the facility. These outlet configurations will enable voice, video, and data transfer from the desktop for students, teachers, school administrators, and staff as required.

Note on Outlet Recommendation samples: in new construction, backboxes and conduits will be behind walls. In renovations or technology upgrade projects where mounting behind the walls is not practical, surface mounted raceway may be used.

Outlet recommendations for sample office spaces:

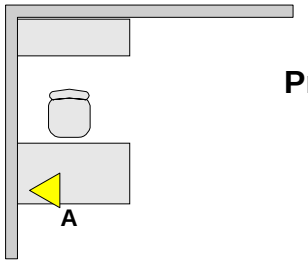
Main Office

Outlets:
7 – A (including 2 floor outlets)
1 – WAP
1 - V



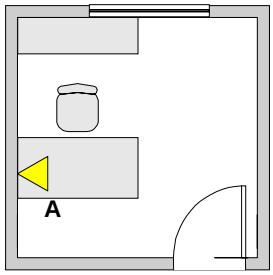
Principal's Office

Outlets:
1 – A



School Administrators
- Department Heads
- Guidance
- Health Services
- Food Services
- Athletic Offices

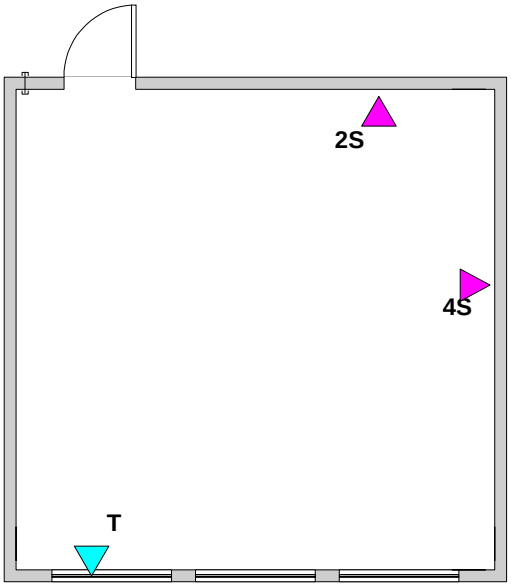
Outlets:
1 – A



Sample outlet recommendations for classroom spaces:

Standard Instructional Classroom

Outlets:
1 – T
1 – 4S
1 – 2S
Consider outlet in ceiling for mounted projector connection to the network

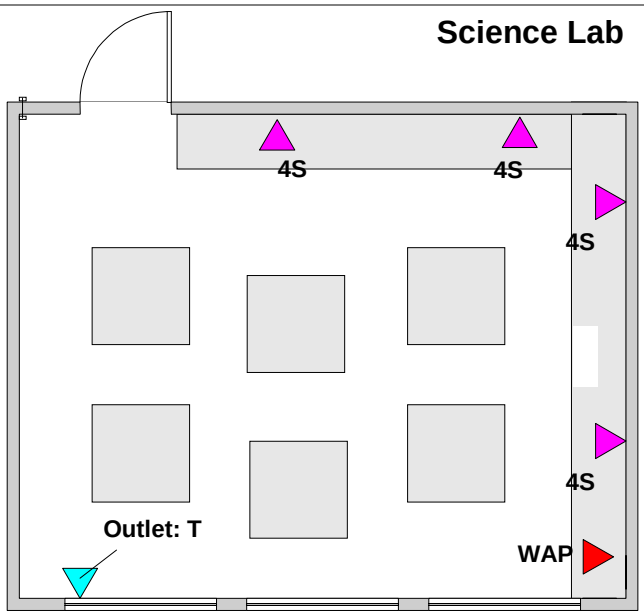


In addition to the standard classroom space, some content areas such as science labs and world languages classrooms will require unique configurations. A variety of science laboratory layouts are available for middle and high school facilities depending on available space and existing room constraints. Outlets should be positioned in a manner so that students can safely use technology tools and resources such as digital microscopes, probes, and sensors within the laboratory environment.

Sample outlet recommendations for science laboratory:

Science Classroom

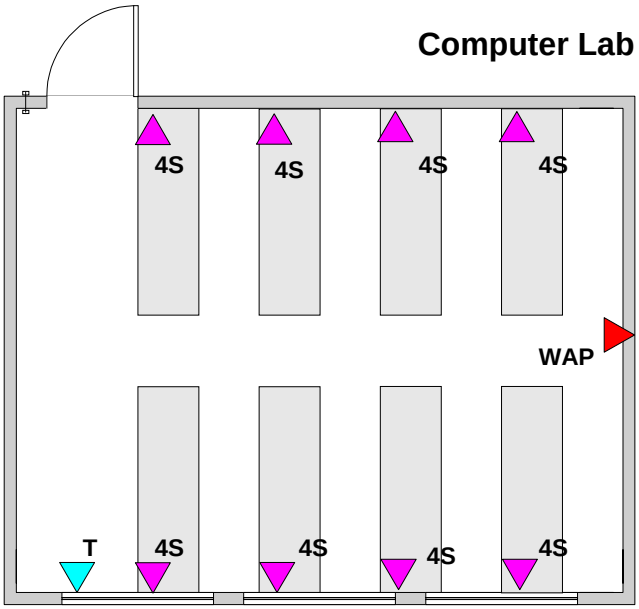
Outlets:
1 – T
4 – 4S
1 - WAP



Sample outlet recommendations for rectangular back- to- back stations computer lab configuration:

Computer Lab

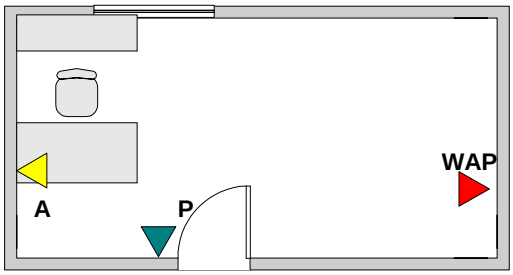
Outlets:
1 – T
8 – 4S
Consider outlet in ceiling for mounted projector connection to the network
1 - WAP



Sample outlet recommendations for Teacher's work room:

Teacher Workroom

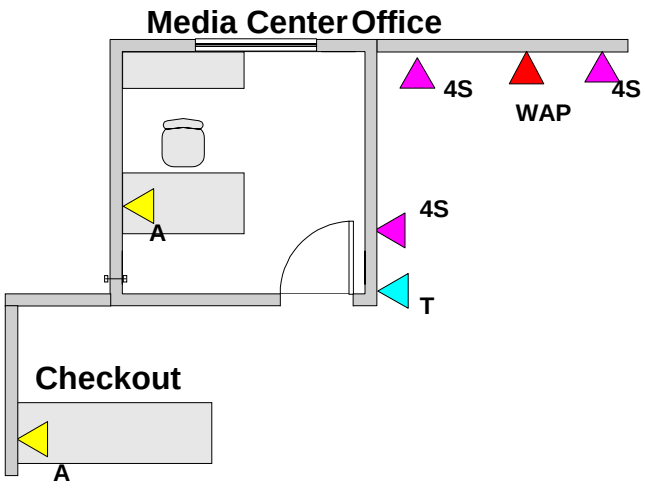
Outlets:
1 - A
1 – P
1 - WAP



Sample outlet recommendations for a typical Library Media Center office and check out area:

Media Center

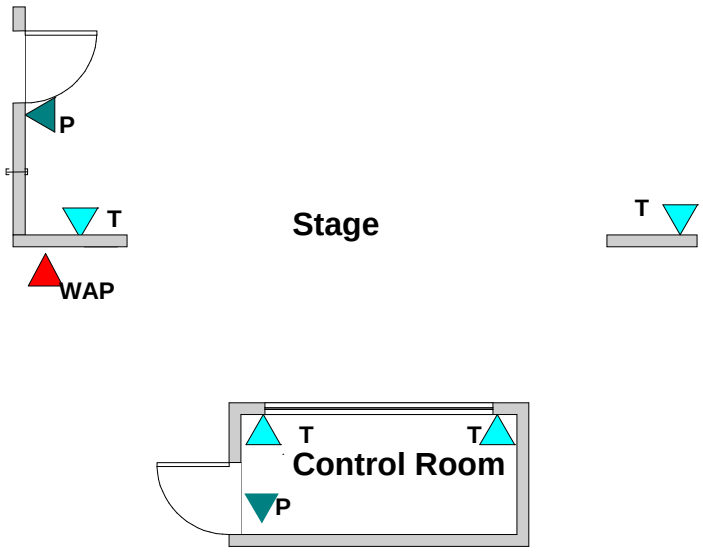
Outlets:
2 – A
3 – 4S
1 – T
1- WAP



Sample outlet recommendations for a typical auditorium/theater:

Theater

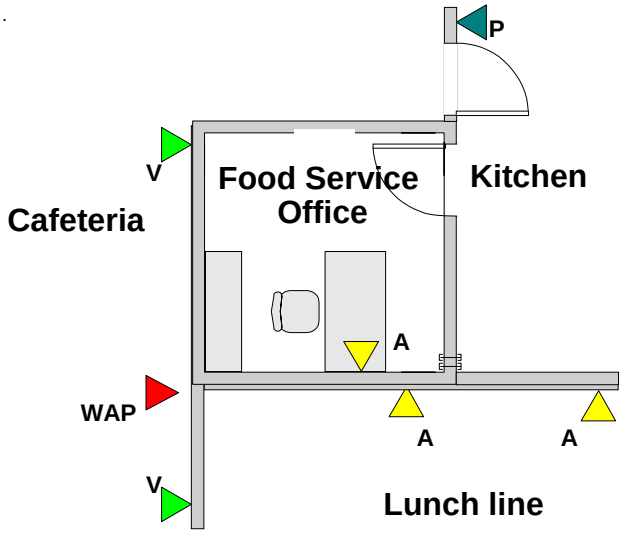
Outlets:
4 – T
2 – P
1 - WAP



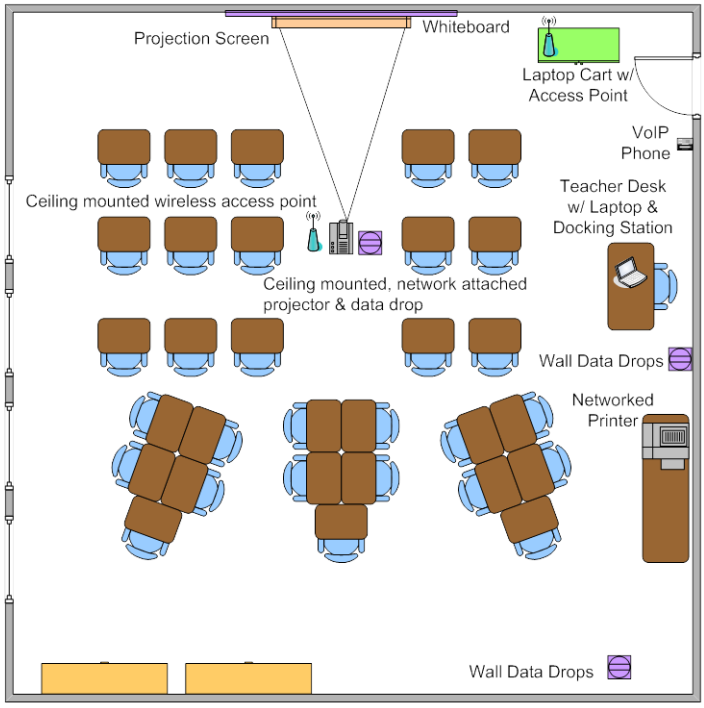
Sample outlet recommendations for typical food services office and cafeteria area:

Cafeteria

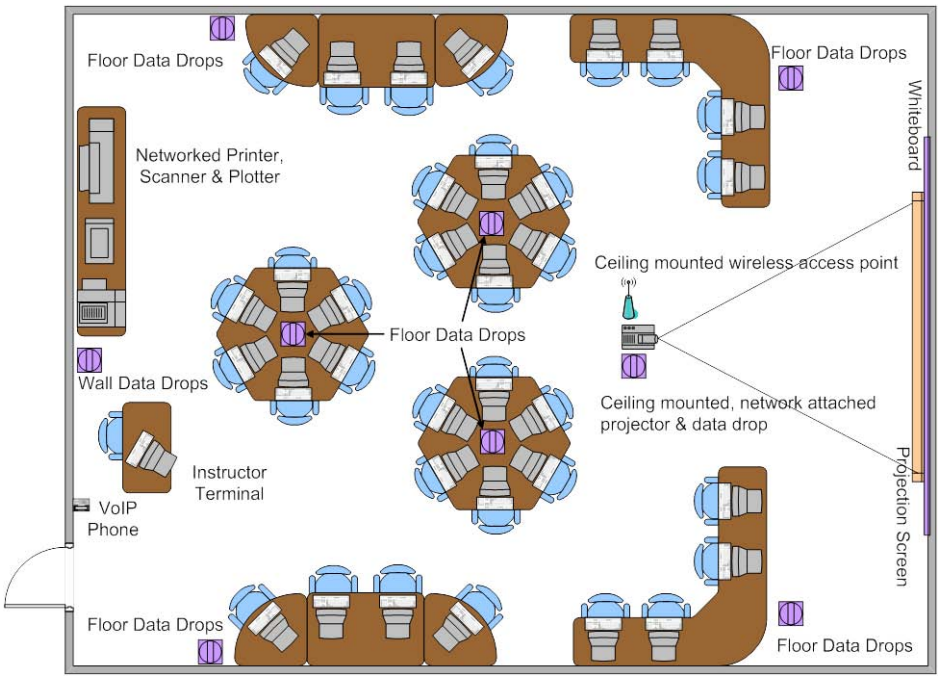
Outlets:
2 – V
3 – A
1 – P
1 - WAP



E-2 Instructional Space Furniture and Space Layout Samples

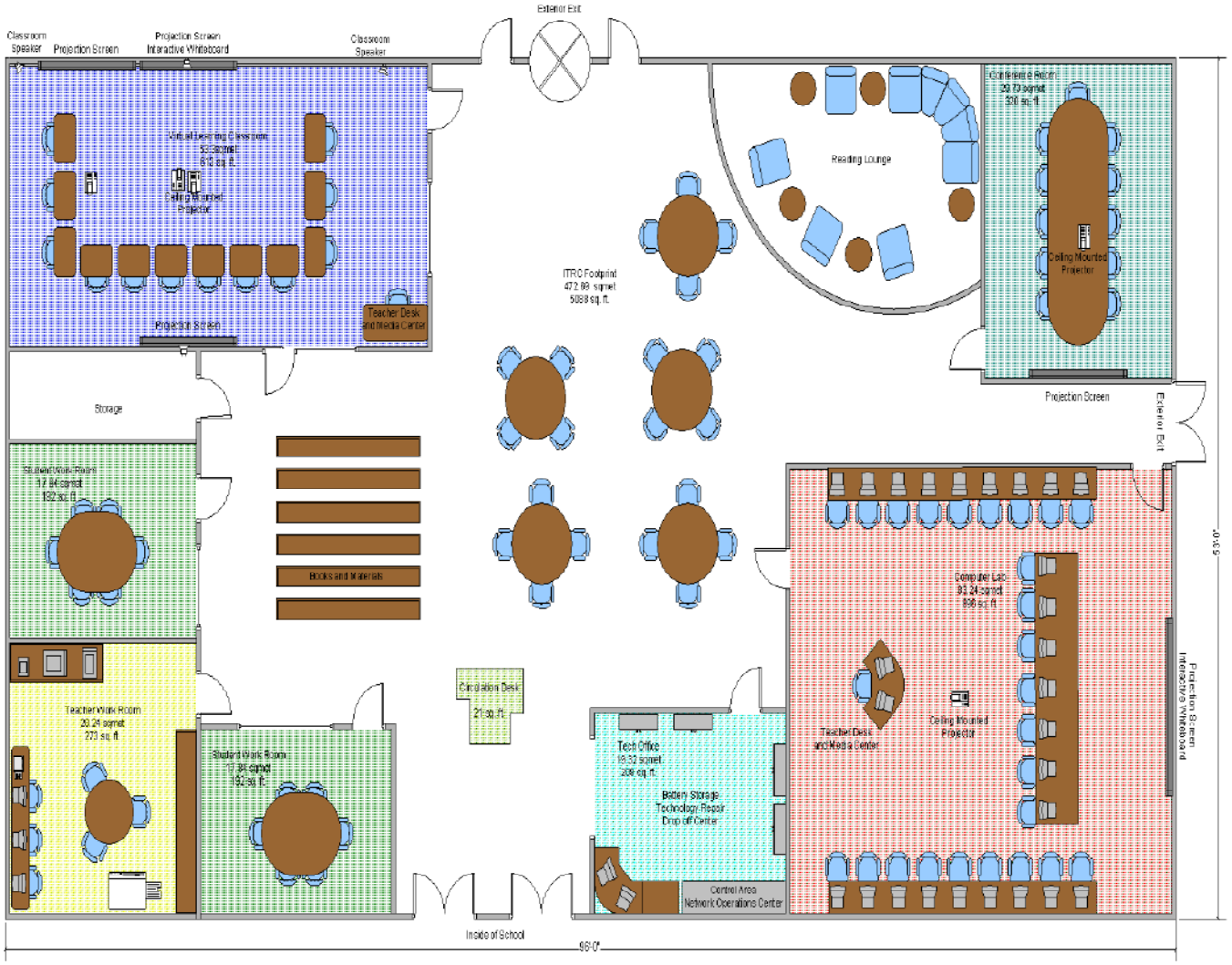


*The flexible space sample above features movable student furniture and wireless access points making it an appropriate layout for one-to-one computing environments.

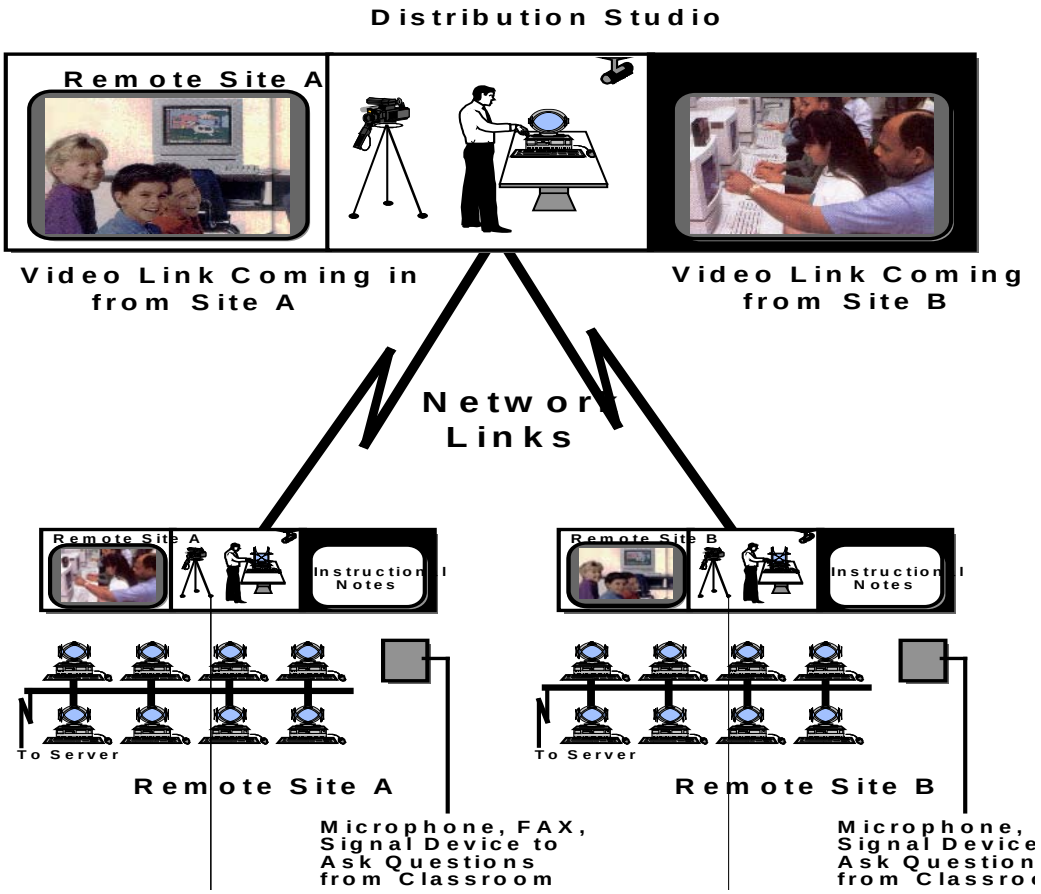


Information Resource/Media Center

Conceptual Overview: Floor Plan



E-3 DISTANCE LEARNING



- **Example: Distance Learning Classrooms Function**

Distance Learning General Guidelines

It is recommended that the distance-learning classroom include a space outfitted as required and the technology necessary to support the distance learning function. The following are general characteristics to consider for the distance learning classroom:

- The basic distance learning classroom provides seating and support for six to sixteen students and one instructor, depending on the type of system and configuration of the room.
- The room is arranged so that the remote classroom and its participants are an approximate reflection of the local room when viewed through the video monitors.
- The spaces are audibly joined so that there is an approximation of sonic continuity from one space to the next.
- The instructor in one space is able to control the camera attention and images displayed in all of the interconnected classrooms.

Distance learning spaces generally operate in four main modes:

1. As a local or remote site in a virtual classroom within the District.
2. As a local or a remote site connecting to a similar space outside the District for learning, or video conferencing.
3. As a media or program presentation space for a small group.
4. As a presentation space to present a broadcast feed from a local feed or a source via the Internet.

The instructor's station includes:

- document camera with light
- computer with the display interconnected to the presentation and conferencing systems that can be used for scheduling, control or presentation
- VHS/DVD and CD players
- System control panel

The room can serve as a presentation space or normal classroom when not needed to support distance learning.

Sample Design Types

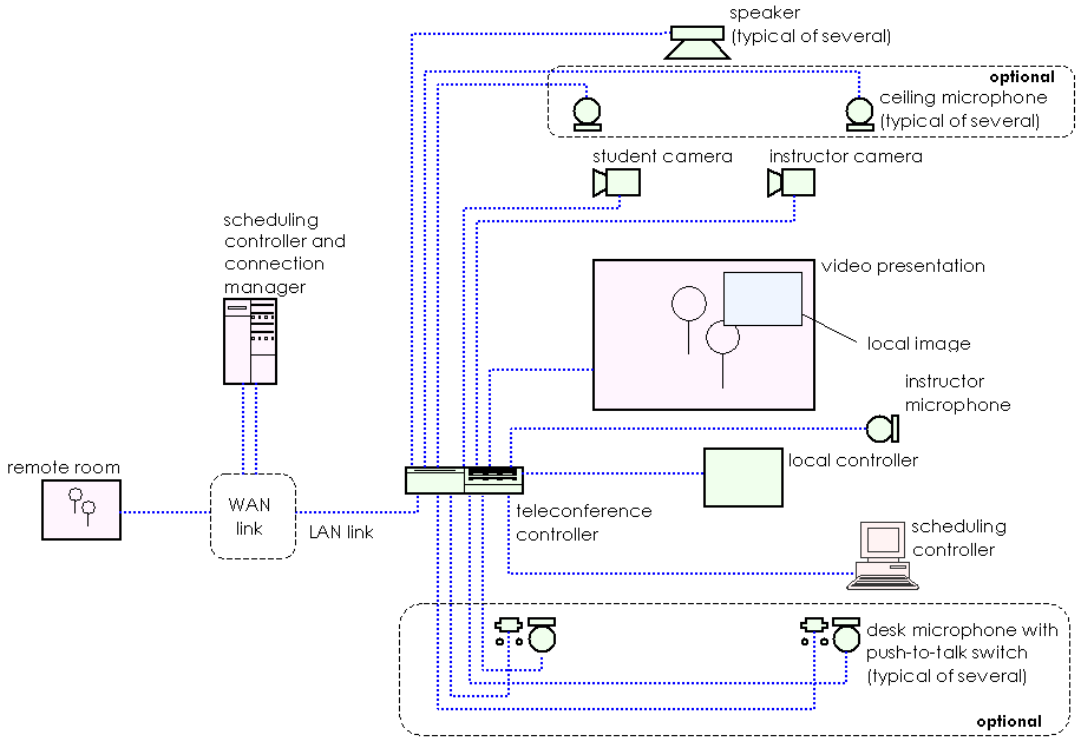
Examples of systems are of three types suited to one of three applications:

- ***Type 1:*** Small classroom, frequently in the area of the library/media center, where a transportable unit is brought in as needed to satisfy a temporary need. These classrooms can be implemented in any school or office facility and require connection only to power and communication lines. Additionally, computers with audio and video components can establish one-to-one distance learning environments provided that video to the desktop capacity exists.
- ***Type 2:*** Elementary and middle school classroom with dedicated distance-learning capabilities. These rooms are outfitted with permanent installation of the distance learning system elements as needed. These spaces are intended primarily for receipt of educational broadcasts, full-class interaction, and presentations where a local instructor monitors the class. Seating is flexible to include chairs, movable desks, or open seating on the floor.
- ***Type 3:*** High school classroom with dedicated distance learning capabilities. These rooms are fitted with permanent installation of distance learning system components as necessary. These spaces are intended primarily for instruction in a dispersed classroom environment where the primary instructor may not be present. Desks are fixed to allow direct interaction between the local student and the instructor at a remote location using a push-to-talk control scheme.

Primary subsystems in the distance learning system include:

- Teleconference controller providing audio and video signal processing, connection management and signal exchange.
- Local controller providing the means to select image, camera point of focus, audio levels and system focus to address student requests and classroom management.
- Video subsystem includes classroom cameras, media playback devices, image router and image presentation device.
- Audio subsystem includes speakers, audio playback devices, instructor microphone and student microphones.

NOTE: A scheduling controller and connection manager is presumed to exist somewhere in the domain of the distance learning classrooms administration.



Standards

Distance learning standards that assure interoperability between systems include ITU H.323 for intercommunication over Ethernet and TCP/IP network and ITU H.320 for intercommunication over ISDN telephone lines. These overarching standards drive the fundamental standards for video, audio and control coding, compression and transmission.

Design Considerations

Distance learning spaces are functionally different from other spaces in the school and must be developed according to the requirements of this function.

Design the system using modular elements that can be upgraded incrementally. Use components that meet industry standards for robustness and durability to maximize usable life.

Minimize the complexity of system repair through the use of modular sub-systems and self-contained components that interconnect through standard fittings and connectors.

Design systems to provide for operational isolation between subsystems and components.

Design provisions and system elements to minimize or eliminate maintenance that requires specialized skills or equipment.

Sample Design Type Elements

Major considerations for each of the design types are documented in the following table:

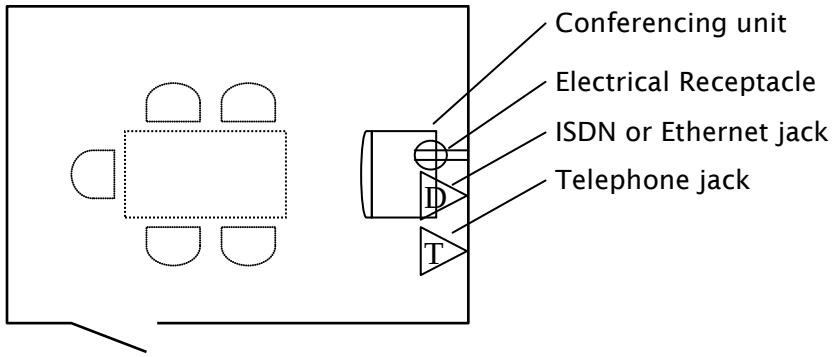
Element	Type 1: Small Classroom	Type 2: Elementary and Middle School Classroom	Type 3: High School Classroom
Teleconference controller	Integrated into unit	Installed at instructor's console	Installed at instructor's console
Local controller	Option	At instructor's console	At instructor's console.
Video display	Direct view monitor integrated into system cabinetry	Direct view monitor installed in custom millwork	Projector mounted to ceiling with screen mounted to wall
Student camera	Integrated into unit	At display millwork	Mounted to wall
Instructor camera	Integrated into unit	At display millwork	Mounted to wall
Speakers	Integrated into unit	Mounted in display millwork or in ceiling	Remote site speakers mounted to wall at display; local reinforcement speakers mounted in ceiling
Student microphones	Integrated into unit with auxiliary portable desktop unit	Mounted at display or in ceiling	Mounted on student desks
Instructor microphone	Wireless unit with auxiliary portable desktop unit	Wireless unit with auxiliary portable desktop unit	Wireless unit with auxiliary desktop unit
Student push to talk and attention request	optional	optional	Integrated into student desks to drive student camera controller and audio system

Element	Type 1: Small Classroom	Type 2: Elementary and Middle School Classroom	Type 3: High School Classroom
Instructor's console	not required	Custom assembly to include computer for presentation, document camera, DVD player, CD player and VHS player	Custom assembly to include computer for presentation, document camera, DVD player, CD player and VHS player

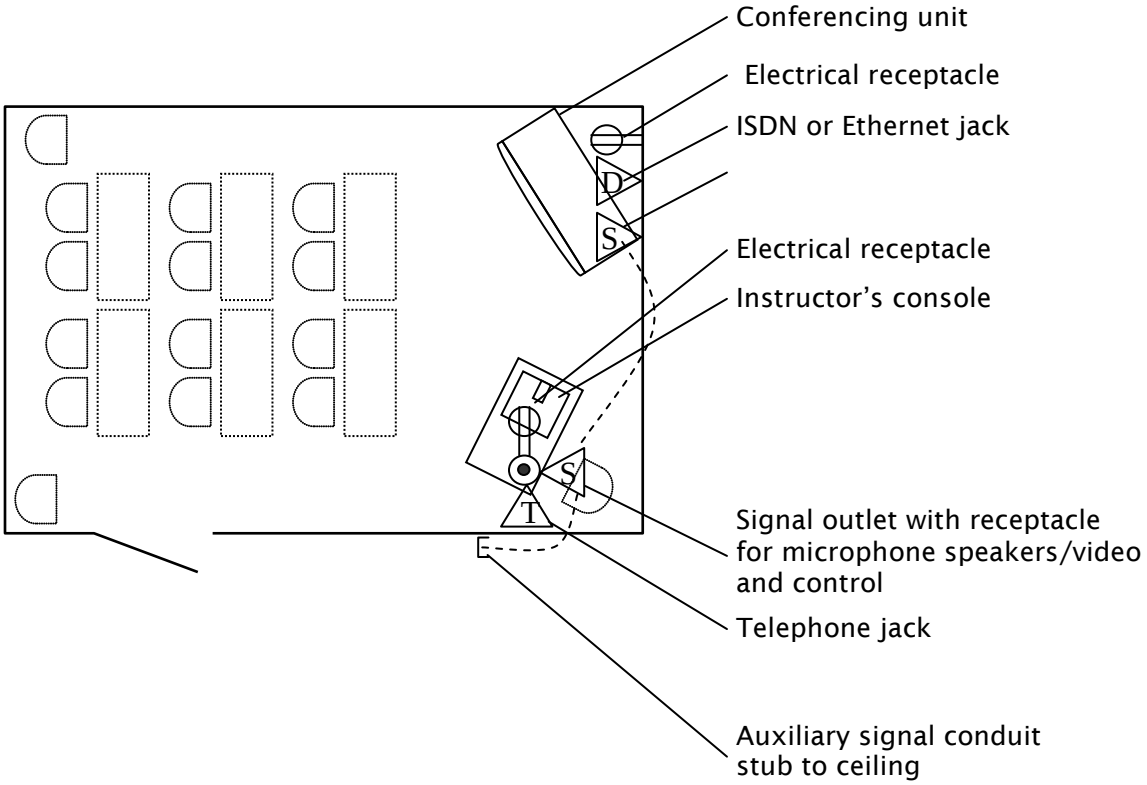
Sample Layouts

Sample layouts for each of the design types are documented in the following graphics:

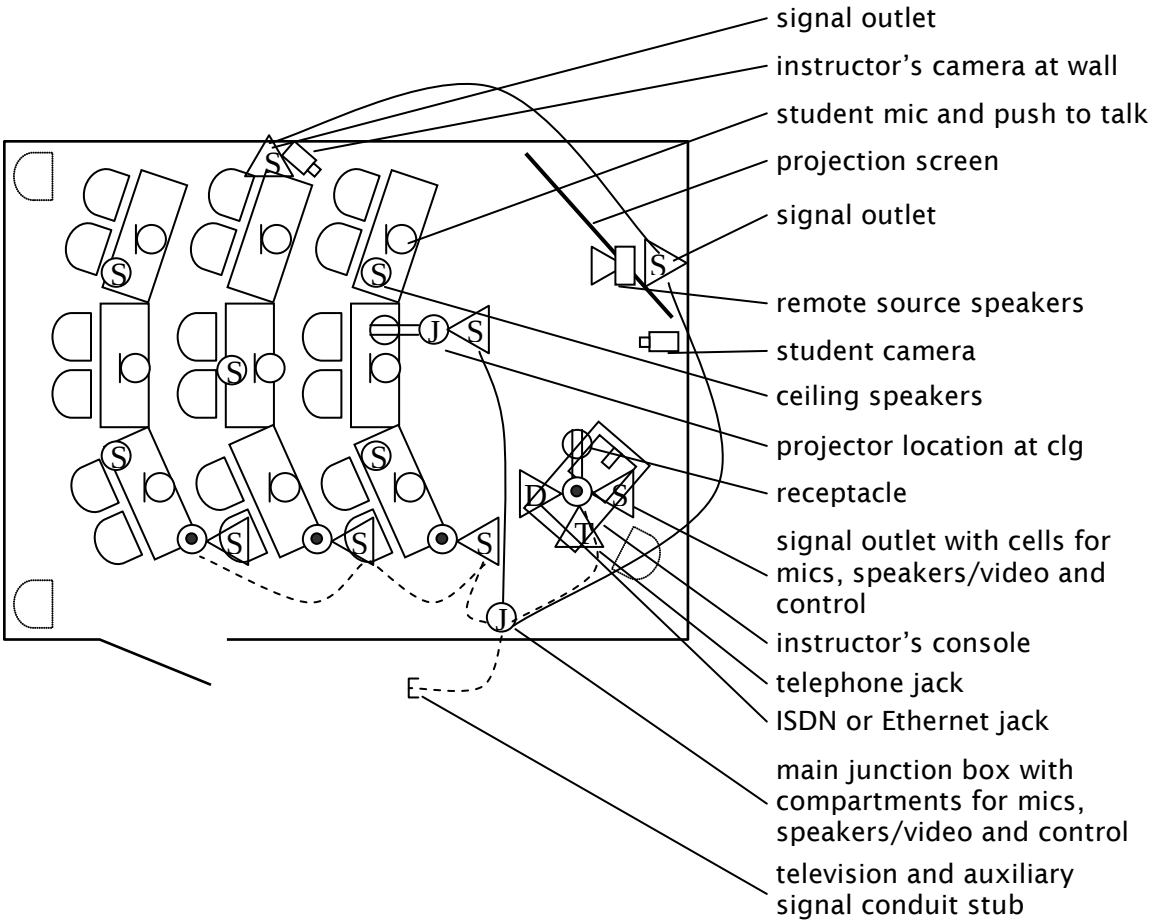
Type 1 Template: Mobile



Type 2
Template



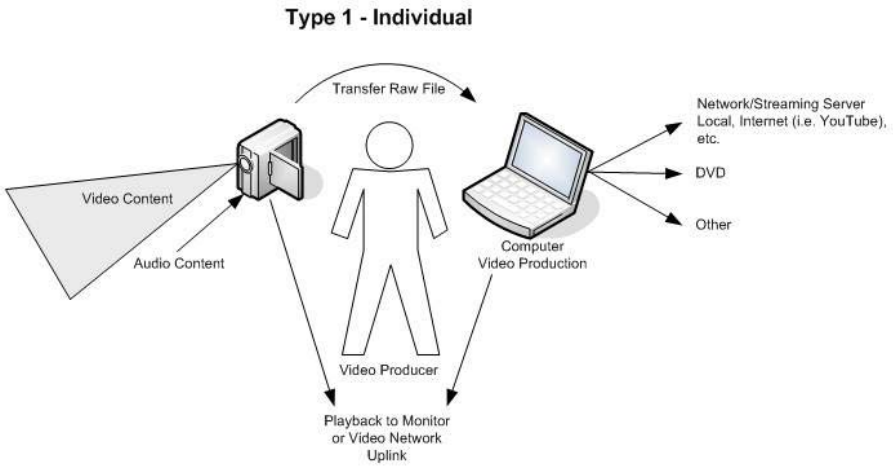
Type 3 Template



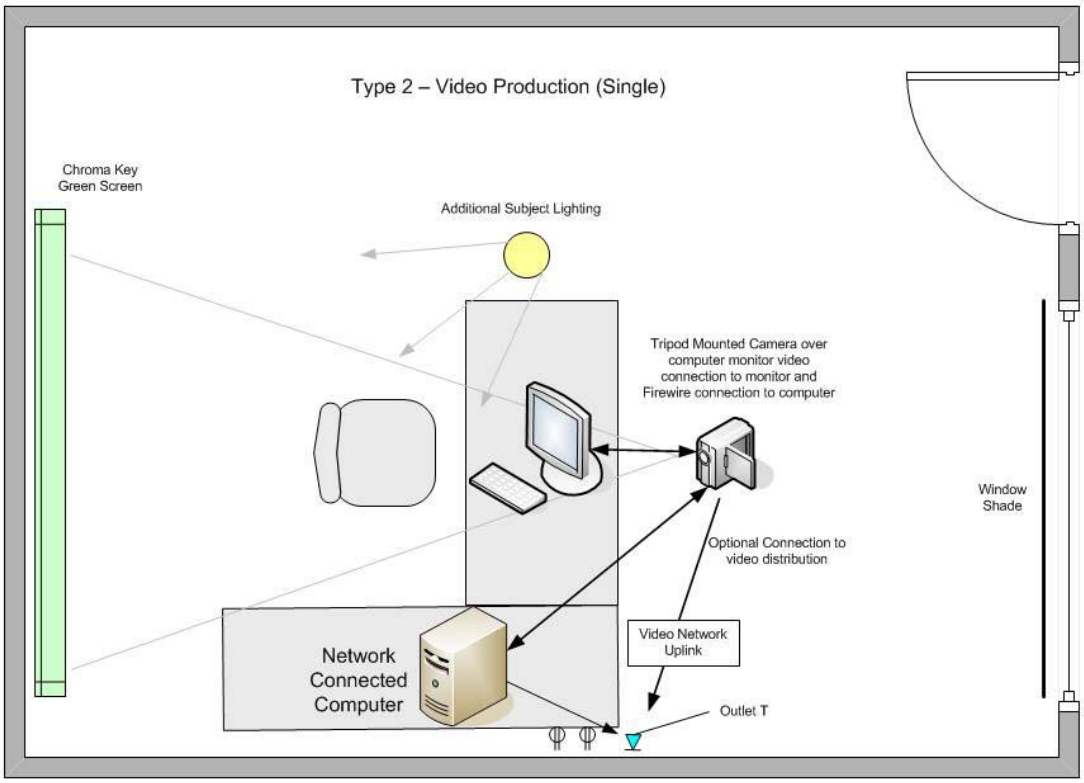
E-4 VIDEO PRODUCTION

Sample layout templates for each of the video production design types are documented in the following graphics:

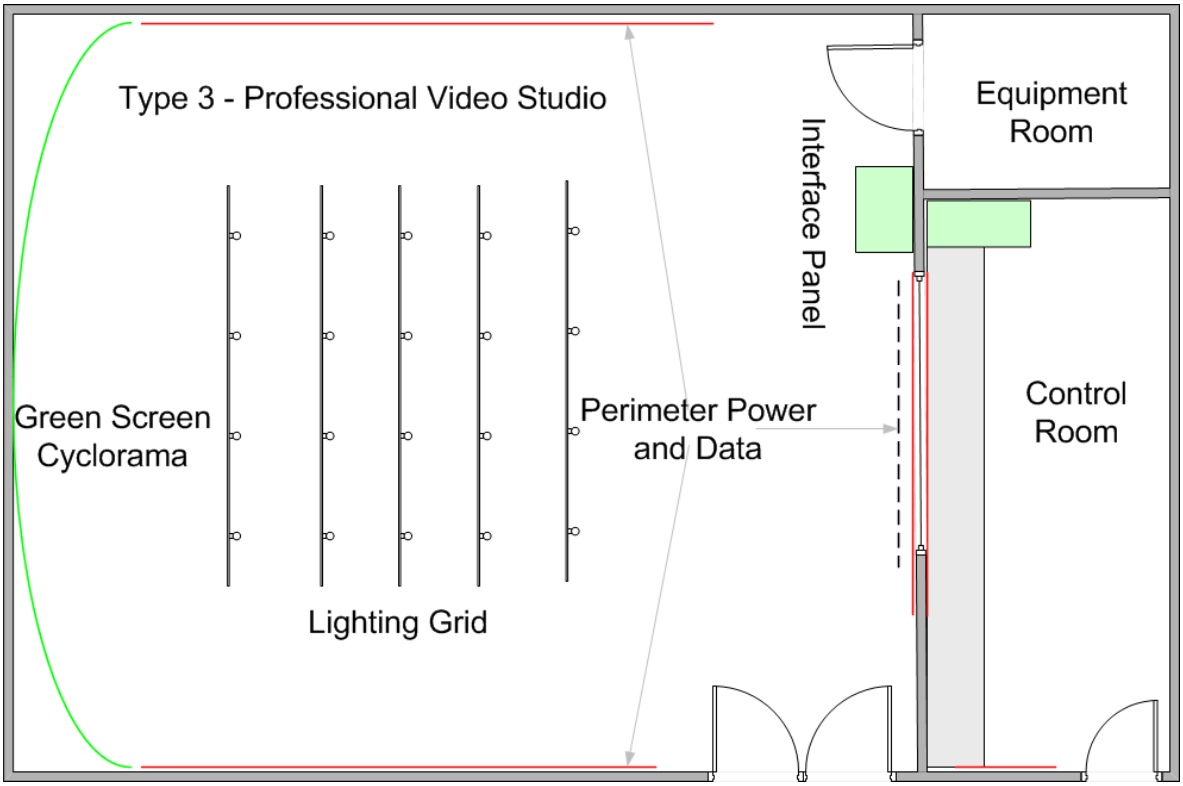
Type 1



Type 2



Type 3


Type 3 - Professional Video Studio
Equipment Room
Interface Panel
Green Screen Cyclorama
Perimeter Power and Data
Control Room
Lighting Grid

Design Considerations

Major considerations for each of the video production design types are documented in the following table:

Element	Type 1:	Type 2:	Type 3:
Dedicated Location	No	Varies, typically integrated into computer lab	Yes, two rooms with glass between, one for production control the other for the production itself
Operation	None/producer is operator	Assistance of production support is typical	Advanced support required during active production, includes production and support
Video Image Capture Equipment	Digital video camera, computer and video editing software. Optional: portable chromakey screen, advanced editing software	Digital video camera with tripod, computer with active firewire connection to camera, advanced video editing software, chromakey screen, production monitor	Multiple digital video cameras typically connected to switches for production control. full scale professional digital video cameras as required for compatibility
Video Stream Manipulation Equipment	None	None	Analog source switches as required for compatibility, camera control units, video distribution amplifiers with effects and production switch connected to distribution network, personal computers
Video Production Monitoring	None.	Connection of video monitor output to local monitor for viewing or projection of live camera capture	Full local video distribution amplifier to bank of monitors displaying video content
Video Production	Local computer, post production	Local computer, post or basic live production (digital only)	Local video production switcher with multiple source connection to broadcast network (analog and digital)
Lighting	Room lighting	Lighting enhanced with additional spot tree lighting fixture	Full independent subject lighting control grid with lighting control panel in control room

Element	Type 1:	Type 2:	Type 3:
Electricity	Battery with charger for video camera	Standard building a/c power to support equipment including video camera, computer and lighting	Separate building power a/c circuits supporting equipment and lighting; power conditioning for sensitive video equipment; consider circuit feeds from backup generator
Audio Recording and Manipulation	Recording microphone is integrated into digital video camera	Recording microphone is integrated into digital video camera or an optional external microphone	Full analog microphones with mixers, boom microphones and wireless microphones; AES/EBU and S/PDIF digital audio accommodation if desired
Room Selection/Treatment	A quiet area with limited controlled entry	If selecting a permanent area, consider location of lighting sources and their controls (windows and fixtures) as well as sources of ambient noise such as doors and hallways; avoid facilities with equipment such as bells, motors and blowers; a separate room with soundproofing is ideal; consider carpeted floor and clear wall behind subject for placement of green screen	Design room for specific purpose; complete room controls for lighting, sound and access control. Full blue or green screen chromakey, alternate staging for various productions needs and curtain backdrops
Network	No live broadcast. Video content stored on camera, transferred to computer, edited and exported to network server or to DVD for distribution Wired or wireless network access	Camera or computer connection to local CCTV or frequency agile modulator for live distribution over CCTV, and/or content stored on computer for later editing and digital distribution; potential, with proper equipment, for live digital or analog broadcast production with chromakey and appropriate digital/analog conversion	Full access to analog and digital television broadcast capabilities, including link to regional or other distribution networks; high speed network access including internet capable of supporting streaming media inbound and outbound

Element	Type 1:	Type 2:	Type 3:
Other	Standardize on media for raw video and digital formats	Standardize on media for raw video and digital formats; simple video switchers for producing more advanced productions; consideration to function as distance learning center as well	Consider HDTV production; Include capability to support VCR, DVD, Blu-Ray, and other source material for incorporation into video productions; consideration to function as support for distance learning production and distribution; consideration for Webcasting, Satellite downlink and rebroadcast

Video Distribution Issues/Strategies

As the industry progresses toward convergence, it is becoming increasingly more difficult to justify a separate analog video distribution network running alongside the data network. With the Federal Communications Commission (FCC) mandate that all television broadcasts must be digital as of June 12, 2009, schools must be certain to design and implement TV infrastructure and delivery systems that conform to the new digital mandate, and can access and distribute digital TV signals as needed.

Schools should be developing solutions for video distribution over the data network that also integrates broadcast media. This can be accomplished through the use of streaming media over the network. Classrooms and other areas where video display is required can link a local projector or other display device to a digital network hub over a standard cabling infrastructure. The end devices will become addressable with video being directed as needed to the video display locations within the school.

With respect to structured wiring and data cables in new facilities, consider a complete digital video infrastructure supporting unicast and multicast over the standard data-cabling infrastructure that is coordinated with network facilities.

If a coax-based video distribution system is still desired, general guidelines include:

- Design a 750Mhz broadband, coax cable system capable of distributing from a central location and accepting live return signals (from any outlet, e.g. location where programming sources may be available such as the video production areas) and modulating and redistributing these throughout the building. Design a homerun topology over a trunk and tap system.

- Install a bi-directional system with a minimum of two drops per classroom, one for connectivity to the local classroom monitor and the other at a location in the classroom for access for return signals or for connectivity to instructional equipment.

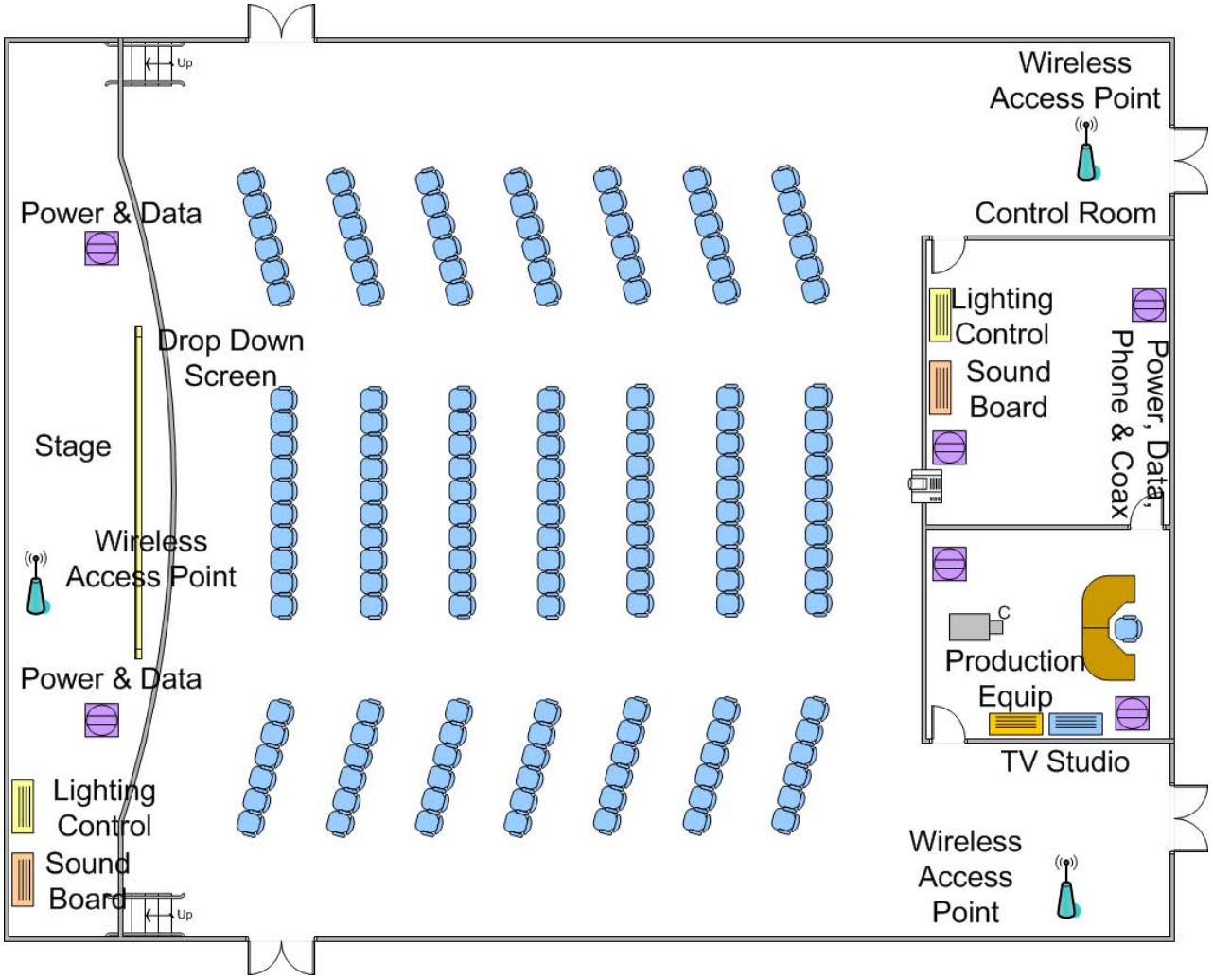
- Install addressable video drops in common areas throughout the school to allow dynamic video display.

- Install video displays in each classroom with analog and digital tuners. From the location where the monitor is mounted, extend the interface ports to an easily assessable location in the classroom, preferably where the second video drop is terminated. Consider overhead mounted projectors interfaced with analog and digital tuner and computer display.

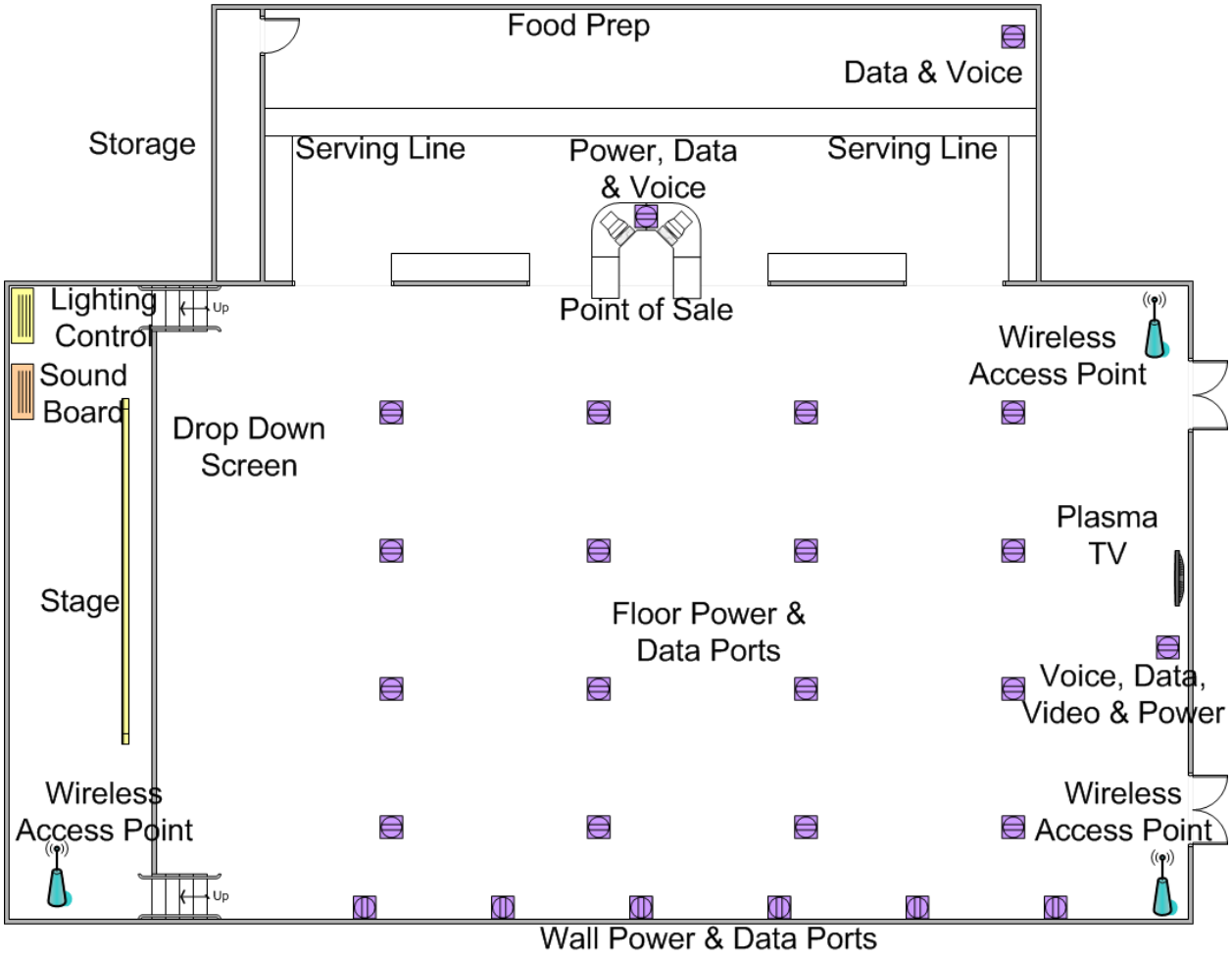
- Install video billboard/message system managed via a computer connected to a high speed network and web-based interface.

E-5 AUDITORIUMS, CAFETORIUMS & GYMNASIUM SAMPLES

The following diagram represents a typical floor plan for an auditorium/theater:



The following diagram represents a typical floor plan for a cafetorium:



The following diagram represents a typical floor plan for the gymnasium area: